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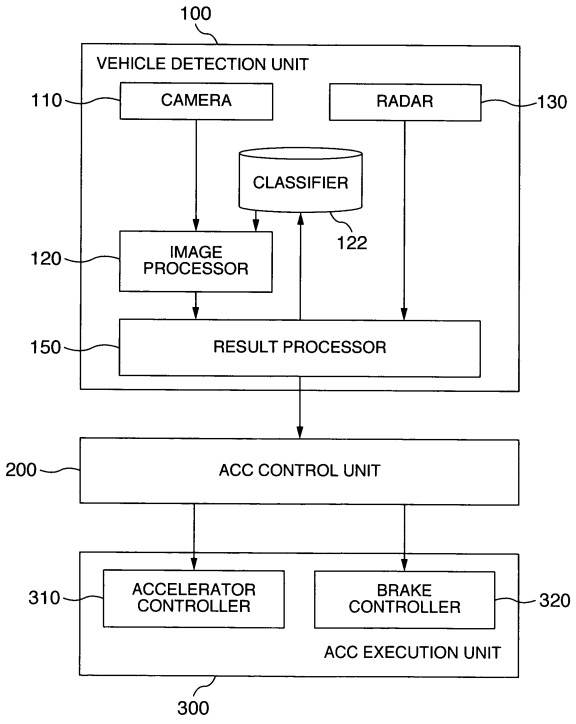
(54) Apparatus and method for detecting vehicle

(57) The invention relates to a vehicle detection apparatus (100) having a classifier (122) that receives features of an image and judges whether the image is a vehicle. The features extracted from the picked-up image are supplied to the classifier so that judgment can be made of whether the image is the vehicle. If the judgment result and the result from a radar (130) are not matched, the picked-up image pattern is registered in teaching data (121). The classifier is updated by learning from the teaching data.

FIG.1



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EUROPEAN SEARCH REPORT

Application Number
EP 05 02 8523

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X,P	EP 1 602 940 A (TOYOTA JIDOSHA KABUSHIKI KAISHA) 7 December 2005 (2005-12-07) * paragraphs [0021], [0025] - [0030], [0034], [0037], [0039] - [0041], [0043]; figures 1-3 * -----	1	INV. G01S13/86 G01S17/02 G06K9/68 G06K9/66
A,D	SHAI AVIDAN: "Support Vector Tracking" IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE, vol. 26, no. 8, August 2004 (2004-08), pages 1064-1072, XP002377437 * the whole document * -----	1	

TECHNICAL FIELDS SEARCHED (IPC)

G01S
G06K

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
Munich	20 April 2006	Schmelz, C

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

see annex

European Patent Office

LACK OF UNITY OF INVENTION
SHEET B

Application Number
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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claim: 1

The subject-matter of independent claim 1 aims at updating a classifier for an image pick-up means (e.g. camera, radar or lidar) by relying on the results of a further (more reliable) image detection means (e.g. camera, radar or lidar) providing data that stem from the same scene as viewed by the image pick-up means.

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2. claim: 2

Independent claim 2 comprises the differing feature over document D1 and over independent claim 1 that the further image detection means is a radar (not a camera as in D1).
The objective technical problem with regard to document D1 solved by the subject-matter of independent claim 2 can, hence, be seen in improving the updating capabilities for bad wheather / poor visibility conditions.

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3. claim: 3

The subject-matter of independent claim 3 is directed to an error detection in an image (no further detection or further detecting means; just one single image is judged/checked).
The differing feature over document D1 and over independent claim 1 is that a correctness/error judging means judges the correctness of the judgement means (whether a vehicle is part of the image or not).
The objective technical problem with regard to document D1 is to check the correct operation of the (vehicle) judgment means.

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4. claim: 4

The differing feature over document D1 and over independent claim 1 is that a "center apparatus" is provided, which -according to description, p. 18, l. 17-18- seems to be a central unit installed at the car dealer or the like. This means that the "center apparatus" is an external unit for teching in data to the classifier, not being part of the host vehicle as assumed for the "vehicle detection apparatus" of the other claims.
The objective technical problem with regard to document D1 is to unify / standardize the update procedure for a plurality of vehicles.

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5. claim: 5

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

Independent claim 5 contains the differing feature over document D1 and over independent claim 1 that instead of updating means (updating the classifier) a registering means is provided for forcing the classifier to learn. This is a significant difference over a simple updating since "learning" involves special electronics like e.g. a neural network.
The objective technical problem with regard to document D1 can, therefore, be regarded as reliably and autarkically training the image pick-up means.

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6. claim: 6

The subject-matter of independent claim 6 deals with a step of picking up an image and another step of detection.
This comprises actually two detection steps or two imaging steps conducted by one and the same imaging or detecting device (no second (detection) device is mentioned in independent claim 6).
Hence, the subject-matter of independent claim 6 is seen as being directed to tracking of objects by identifying the object (vehicle) and taking the second detection result if there is no coincidence or match.
The objective technical problem with regard to document D1 is: Improvement of target tracking.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 05 02 8523

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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20-04-2006

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1602940 A	07-12-2005	CN 1704719 A	07-12-2005
		JP 2005345251 A	15-12-2005
		US 2005270225 A1	08-12-2005

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82